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Vanda Almeida

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Adrián Hernández Martín

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Vanda Almeida
Joint Research Centre (JRC-Seville), European Commission
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Keyword: Minimum Income, coverage, adequacy, poverty, microsimulation, EUROMOD

JEL Cassification: H53, I32, I38

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Abstract

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*Corresponding author. Email: Adrian.HERNANDEZ-MARTIN@ec.europa.eu

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission. The results presented here are based on EUROMOD version I3.86+. Originally maintained, developed and managed by the Institute for Social and Economic Research (ISER), since 2021, EUROMOD has been maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission in collaboration with Eurostat and national teams from the EU countries. We are indebted to the many people who have contributed to the development of EUROMOD. The results and their interpretation are the authors' responsibility. We acknowledge the fruitful comments of Ana Agúndez, Anna Burger, Olivier Bontout and Viginta Ivaškaitė-Tamošiūnė, and of the participants of the XXIX Meeting on Public Economics and the EUROMOD Annual Meeting and Research Workshop 2022. We immensely thank Fidel Picos for his valuable insights and support with the methodology.

1. Introduction

Minimum Income (MI) schemes play a crucial role in alleviating poverty and social exclusion in the European Union (EU), guaranteeing a last-resort safety net to households with insufficient resources. Although all EU countries provide some type of MI support, the effectiveness of this support in reaching those in need is highly heterogeneous across countries (Figari et al., 2013; Frazer & Marlier, 2016; Natili, 2020; Nelson, 2013). This performance is typically dependent on the interaction between two main dimensions of the design of MI schemes: (i) coverage, i.e. the extent by which they reach individuals in need, and (ii) adequacy, i.e. the generosity of the level of support provided by the benefit to its beneficiaries. In September 2022, the European Commission proposed a Council Recommendation to improve, among others, the adequacy and coverage of MI support.[2] Understanding the gaps in these two dimensions and avenues for reforms is key to ensuring that MI support is adequately provided to those in need.

Comparing the effectiveness of MI schemes between countries poses several methodological and data-related challenges. Most existing studies perform a somewhat descriptive analysis of the characteristics and reach of MI schemes, mainly based on institutional data reporting benefit levels for different family types (e.g. Nelson, 2010) or on survey income microdata (e.g. Ayala & Bárcena-Martín, 2020). Administrative data, although more complete and precise in nature, is not easily accessible for all EU countries, and comparability across countries is low given that they reflect the specificities of each country's system without any form of harmonisation being considered (see Bargain et al., 2012 for a country-specific analysis on the extent of MI non-take-up in Finland using register microdata). In contrast, survey data are more easily available and typically subject to harmonisation procedures, yet they usually suffer from bias because households with low incomes tend to underreport benefit receipts due to problems in recalling specific benefits or discouragement due to stigma (Bargain et al., 2012; Figari et al., 2012; Lynn et al., 2004). This leads to an underestimation of the degree of support provided by MI schemes. Additionally, in survey data is a common practice to report in an aggregated way certain income components. For instance, in EU-SILC, MI schemes are often reported jointly with other 'social exclusion benefits not elsewhere classified', impeding an accurate assessment of their impacts in isolation from other cash benefits (Figari et al., 2013). An alternative approach is to use microsimulation modelling rather than relying on reported benefit data, which allows for the simulation of the levels of MI benefits according to the policy rules in place in each country (Figari et al., 2013). This approach, however, also faces certain limitations, particularly related to the overestimation of MI support levels because of lack of data on take-up and/or other information needed to accurately simulate

[2] Proposal for a Council Recommendation on adequate minimum income ensuring active inclusion (further information about the proposal can be consulted at https://ec.europa.eu/social/main.jsp?langId=en&catId=89&newsId=10417&furtherNews=yes last accessed 14th October 2022).

the eligibility conditions of the schemes. As such, existing studies using microsimulation modelling rather assess the intended effect of the schemes, abstracting from estimating their real impact in light of the difficulties to capture benefit receipts.

In this paper, we exploit a methodology that builds on the advantages of microsimulation models for the analysis of the effectiveness of MI schemes while trying to overcome the limitations of this approach. We use EUROMOD, an open-source static tax-benefit microsimulation model for all EU countries, and apply a calibration procedure that corrects for the overestimation of MI support by matching the simulated levels of expenditure to official expenditure data from administrative sources. Although ad hoc corrections to the simulation of MI schemes have been explored from a country-specific perspective (e.g. Tasseva, 2016) or from a selection of EU countries (e.g. Matsaganis et al., 2008), this is, to the best of our knowledge, the first time that such assessment has been conducted for all EU countries using a harmonised approach. Having obtained a new 'closer to reality' baseline, we then assess the effectiveness of the current MI schemes in the EU, focusing on their levels of coverage and adequacy, poverty-alleviation effects and expenditure. Finally, we turn to the simulation of possible reforms to existing schemes, considering changes to coverage and adequacy, and investigate how this would affect the cost and effectiveness of MI support. The reforms considered are theoretical and not targeted at changing country-specific aspects of the MI scheme of each country. Hence, the goal of the simulations is not to provide a comprehensive analysis of all the possible reforms that could be considered by the authorities in each country but rather to: (i) provide a methodological framework to reflect on the main aspects that should be considered when reforming MI schemes; (ii) show how far/close the current MI scheme for each EU country is from eradicating extreme poverty; and (iii) how this would change if adequacy (first) and coverage (second) improved.

Our paper contributes to the study and evaluation of MI schemes in two main ways. First, it provides a methodological development, by exploiting a methodology to calibrate the simulation of all EU MI schemes. It allows bypassing of the difficulties in modelling take-up rates and non-income eligibility conditions through a simple and easily implementable calibration procedure. This methodology not only produces a 'closer to reality' simulation of MI support in each country but also constitutes a harmonised framework that can be used to produce comparisons of MI schemes across countries in a consistent way. This is relevant for public policy purposes, as it increases the accuracy of poverty measurement, which is key for policy-making decisions and allows for a more precise analysis of the effectiveness of existing MI instruments. Second, our paper provides a framework for identifying existing gaps and reflecting on possible ways to reform current MI schemes, sharing important insights about the potential and challenges of different options, which is also a crucial input from a policy perspective.

The rest of the paper is organised as follows. In Section 2, we present the way MI schemes are currently simulated in EUROMOD and discuss some limitations. In Section 3, we

introduce our calibration procedure and present some indicators to validate the new baseline simulation of MI schemes. In Section 4, we assess the effectiveness of existing MI schemes in EU countries based on the new baseline simulation. In Section 5, we describe the hypothetical reform scenarios and present the impact that they would have on the effectiveness and cost of MI schemes in the EU. Finally, in Section 6, we discuss the main results, some limitations of our approach and avenues for future research.

2. The simulation of MI schemes in EUROMOD

The analysis in this paper uses EUROMOD, the open-source static non-behavioural tax-benefit microsimulation model for all EU countries, version I3.86+.[3] The tax-benefit systems under assessment refer to those in place as of June 2019.[4] EUROMOD uses microdata from the EU Statistics on Income and Living Conditions (SILC) survey. For this paper, we use the 2019 cross-sectional wave, comprising 2018 incomes. Uprating factors are used to bring the reported income values from the income reference period up to the policy year.

The list of MI schemes under assessment for each country together with some country-specific comments on the simulation in EUROMOD is presented in Tables A.1 and A.2 of the Appendix.[5] Although MI schemes are typically characterised as last-resort safety nets, there is not a harmonised definition, and different schemes have been considered in the literature under wider or more concrete classifications.[6] In this paper, we broadly consider

[3] For a detailed presentation of EUROMOD, see Sutherland and Figari (2013) and https://euromod-web.jrc.ec.europa.eu/.

[4] Although 2020–2021 policy years are already available in version I3.86+ of EUROMOD, the decision of using 2019 as the main policy year is not arbitrary and reflects two main considerations. First, in our analysis, we aim to capture the main structural elements of MI schemes, leaving aside the exceptional circumstances of the COVID-19 pandemic in terms of labour market conditions and temporary policy responses. Second, the availability of administrative official data on expenditure in MI schemes comes with delay, while our calibration draws from these data to adjust the simulated results. Given that official statistics might not be available for the latest policy years, we use the 2019 system as a way of reconciling the simulated and official figures. The only exception to the 2019 rule relates to the Spanish case, as in our setting, we also simulate a nationwide MI scheme that entered into force in 2020. This is to account for the importance of this structural change in MI support.

[5] The list was consulted with EU and national experts in the context of the European Commission previously referred proposal. Note that a wider classification of MI schemes, potentially accounting for other benefits to support low-income households (for example, housing benefits, child and family allowances, etc.), would lead to higher coverage and adequacy levels. In this respect, our results should be interpreted as a lower bound of the potential impact MI schemes would have under the inclusion of a broader range of benefits.

[6] For example, on the effectiveness of MI schemes in Spain, Ayala et al. (2021) broadly consider all means-tested non-contributory benefits in their analysis, thus, for instance, including the unemployment assistance scheme within this list. For the same country, however, Hernández et al. (2022) consider unemployment assistance an intermediary step before the general MI schemes and only focus on the latter. For their study on a selection of EU countries, Figari et al. (2013) avoid making ad hoc assumptions on the list of MI schemes and rely on the Mutual Information System on Social Protection for its definition.

MI schemes as means-tested, non-contributory benefits, which usually work as a top-up depending on family size and composition, and that are applicable to families not eligible to all other benefits (either because they did not fulfil the eligibility criteria at a previous stage or because they had already exhausted them). In addition, they usually embody activation clauses to promote reintegration into the labour market.

Generally, the conditions to access MI schemes consist of an income test, including market incomes, benefits and pensions received by all members of the family and a set of non-income eligibility conditions (for example, age, residence or asset-related conditions). How accurately these conditions are simulated is crucial to determining the correct identification of potential beneficiaries.

Income tests are generally simulated in EUROMOD with a high degree of accuracy given the availability of detailed income variables in EU-SILC. However, two caveats apply in this regard. First, due to lack of information about monthly incomes, the income test assumes that the annual income of the family is equally distributed throughout the 12 months. Thus, possible fluctuations in monthly incomes are not captured in the simulations. Second, to the extent that the detailed income variables in EU-SILC are subject to measurement errors, the subsequent simulations are influenced accordingly.

Regarding non-income eligibility conditions, rules related to certain socio-demographic characteristics, namely age-related requirements and family links between cohabitant individuals, are simulated accurately since they are usually well-captured in EU-SILC. However, other non-income conditions can be simulated only partially. Typical examples include asset-related conditions,[7] time of residence in the country, registration at employment offices or non-refusal to take up jobs. As a result, the number of beneficiaries in EUROMOD (and hence the expenditure) is usually overestimated, i.e. the model identifies as eligible some families that would not be entitled to the benefit if non-income conditions were taken into account. Additionally, and likely more importantly, the model overestimates the number of beneficiaries because in reality not all entitled families do take up the benefits due to both demand-side factors (e.g. stigma, lack of information) and supply-side factors (e.g. discretionary rules applied by the administration, budgetary limitations).[8] This overestimation has crucial implications when assessing the poverty-reducing effects of the schemes, as not only the poverty-reducing impact of a country-specific MI might seem overestimated but the ordering of countries in a cross-country

[7] Investment incomes are present in the EU-SILC data, and they are used in some countries to derive financial assets (by capitalising those incomes). However, this information is insufficient to account for the full extent of the assets portfolio.

[8] See, for example, Hernanz et al. (2004) for a compendium and Bargain et al. (2012) or Fuchs et al. (2020) for country-specific analyses.

comparison might also significantly change depending on the extent of non-take-up (and/or the accuracy of the simulations) across countries.

To tackle the overestimation explained above, some country models in EUROMOD apply a benefit take-up adjustment to remove the beneficiary status to some simulated entitled families. However, this is done only in a few countries (Belgium, Spain, Estonia, Finland, France, Croatia, Ireland, Poland, Romania, Slovenia and Slovakia) and following different methodological approaches, varying from the application of available estimates for non-take-up rates to the simulation of ad hoc adjustments based on certain assumptions (e.g. disregarding beneficiaries entitled to small benefits).

3. A methodology to calibrate the simulation of MI schemes

The shortcomings of the simulations of MI schemes pose important problems not only for an accurate assessment of the effectiveness of existing MI schemes but also for a meaningful evaluation of possible reforms to these schemes. To do this, which is the focus of the next two sections, we start by applying a calibration procedure, based on official statistics, to correct the existing simulations in EUROMOD and to obtain a 'closer to reality' modelling of MI schemes.

The calibration procedure is performed in a harmonised way for all EU countries to allow for meaningful cross-country analysis of MI schemes. We therefore start by removing the ad hoc adjustments that are done in EUROMOD for a few countries, as mentioned above, to obtain a 'clean' baseline, representing the EUROMOD simulations without any adjustment to account for overestimation. We call this the 'Full entitlement baseline'. We then apply our calibration procedure to this baseline to obtain a closer-to-reality 'Calibrated baseline'.

3.1. The choice of external data

To calibrate the model, different types of external data can be used depending on the data availability. Three main possibilities are considered: take-up ratios, number of beneficiaries and total expenditure. The first option would imply to select, among the eligible observations in EUROMOD, a share of them equal to the official take-up rate of the benefit (i.e. the share of actual beneficiaries over the eligible population). This would maintain relative consistency in EUROMOD but might overestimate (or, more rarely, underestimate) the number of actual beneficiaries in cases where the potential beneficiaries are already overestimated in EUROMOD (due to non-simulation of some non-income eligibility conditions). Furthermore, the availability of take-up rates is rarely available in a comparable and harmonised way across EU countries.

The other two options present common advantages and drawbacks. The main advantage is that they are consistent with reality in absolute terms, i.e. they fully align the corresponding

variable (beneficiaries or expenditure) with official statistics. This means that we account for, simultaneously, non-take-up and non-simulation of non-income conditions. However, the drawback is that this type of calibration also hides any possible issue in the original simulations, since no matter how many potential beneficiaries are identified, the final number (or the final expenditure) will always be aligned with official statistics by construction.

Calibrating by beneficiaries or expenditure theoretically leads to the same results if the probability of being an actual beneficiary does not differ across income levels. If this is not the case (e.g. because individuals with lower or zero income have higher probabilities to take up the benefit), calibrating randomly using one or the other would lead to different results (e.g. to keep the same expenditure, fewer but poorer beneficiaries would need to be selected). Regarding the choice between beneficiaries or expenditure, the former is more problematic than the latter, since the official figures for number of beneficiaries may differ conceptually across countries and also differ in the way they are computed in EUROMOD. For example, very often it is not clear what the measurement unit reported in official statistics is (e.g. family heads, all individuals in the family or household), nor how they are counted (e.g. in a specific point in time, as an average over the year or as total unique recipients within a given period). In contrast, total annual expenditure seems a less ambiguous variable, typically accounting for the total spending on the scheme in the year. For this reason, we use it for the calibration, obtaining it from national sources as reported by national experts in the EUROMOD Country Reports. The corresponding numbers for 2019 are reported in Table A.1 of the Appendix.

3.2. The selection of beneficiaries

To apply this expenditure-based calibration, an iterative algorithm has been designed to select actual beneficiaries among the eligible observations in each country until the total expenditure resulting from the EUROMOD simulation matches the total expenditure reported in the official administrative data. In our setting, the total simulated expenditure is defined as $\bar{X}_S$, whereas the total expenditure reported in the official source is $\bar{X}_O$. We aim to minimise an objective function $f(x)$ by selecting a subset of actual beneficiary households h among all potential eligible households H such that $h \subseteq H: \min(f(x))$. Our objective function is consequently defined as

$$f(x) = (1 - \frac{\bar{X}_S}{\bar{X}_O} \cong 0.01) \text{ subject to } \bar{X}_s > \bar{X}_O.$$

To optimise the selection of the actual beneficiary households h, we follow Hernández et al. (2022) and assume that the probability of receiving the benefit among eligible

beneficiaries (P_i) depends on a deterministic and a random component.[9] Formally, for each household i:

$$P_i = w * RC_i + (1 - w) * DC_i$$

where $RC_i \in (0,1)$ is the random component, following a uniform distribution, $DC_i \in (0,1)$ is the deterministic component, which measures the generosity of the entitlement, and w is the weight measuring the importance of each component in determining the probability. The calculation of DC_i is as follows.

$$DC_i = 1 - \frac{IT_i}{IT_i + MI_i}$$

where IT_i corresponds to the total income being subject to each MI scheme means testing, and MI_i is the minimum income benefit to which the household is entitled to. As a consequence, the higher DC_i is, the more generous the entitlement is and the more likely the household is to be selected as an actual beneficiary.

Once P_i has been computed for each household, an iterative algorithm is implemented in order to minimise our objective function. In practice, we define a calibration parameter $C = 1$ that is sequentially decreased in 0.001 steps and confronted to P_i. Then, for each subset of households h whose $P_i > C$, the resulting $\bar{X}_S$ is calculated and, consequently, the objective function is solved until the latter is minimised for an optimal parameter C^*. This process is repeated for each EU country.[10]

Importantly, w is treated as an exogenous parameter in our setting, and different choices can be put in place to balance the importance of the deterministic and random components. Under a full deterministic approach, such that $w = 0$, only the poorest households[11] would end up being selected as actual beneficiaries, whereas as long as $w > 0$, other elements beyond the generosity of the entitlement weigh in the probability. This entails that, eventually, households entitled to a low benefit might also end up being selected as beneficiaries. As argued in the studies on the drivers of non-take-up (Hernanz et al., 2004),

[9] Note that several approaches can be implemented to select the actual beneficiaries. In this paper, we opt for a rather simple strategy, which is applied in a harmonized way to all EU Member States. However, in countries where, for instance, administrative microdata on beneficiaries of MI schemes are available, the selection of beneficiaries could be performed using more refined methodologies (e.g. estimating the likelihood to be an actual beneficiary on the socioeconomic characteristics of the eligible population).

[10] A potential limitation of the calibration procedure is that it could lead to the selection of a limited number of observations, especially in countries where sample sizes are already small due to strict eligibility criteria. Table A.4 in the Appendix reports the total number of observations of beneficiaries of MI schemes before and after the calibration for each country. Small sample sizes might prevent a meaningful analysis of the socioeconomic characteristics of MI recipients.

[11] Typically, the lower the household income is, the higher the benefit. Hence, under the deterministic approach, it is more likely that households with very low income will be selected.

the generosity of the entitlement plays a crucial role in determining whether or not to claim a benefit, although other non-monetary factors are also relevant (for instance, individuals living in small cities or rural areas are less likely to take up the benefit). Our random component roughly approximates these non-monetary elements, yet we parsimoniously assume that for all individuals the weights of the random and deterministic components are the same ($w = 0.5$). As can be noted, the subsequent simulations and the eventual impact of the schemes are sensitive to the choice of this weight. Since our algorithm selects beneficiaries as to align with a fixed level of expenditure, setting a higher weight for the random component would imply selecting more actual beneficiaries entitled to lower benefits and vice versa. In the Appendix, we include a sensitivity analysis to the calibration of parameter *w*, presenting the results using a full deterministic approach ($w = 0$) and a full random approach ($w = 1$).

3.3. Validation of the Calibrated baseline

To validate the new Calibrated baseline obtained with the above-mentioned procedure, we compute some indicators, focusing on the levels of expenditure and the at-risk-of-poverty (AROP) rates.

First, we consider the ratio of simulated total expenditure in EUROMOD to the actual expenditure, the 'validation ratio'. We compute this ratio both for the 'Full entitlement baseline', obtained with the model before our calibration procedure, and the 'Calibrated baseline', obtained with the model after our calibration procedure. The results are presented in Table A.1 in the Appendix. As reported in the table, total expenditure in the 'Full entitlement baseline' is overestimated by at least 30% for 18 countries. For many of them, the ratios are even 2 or higher. The overestimation is particularly large in Ireland (8), Estonia (3.5), Spain (3.2) and Bulgaria (3.1), followed by Austria and Latvia. As expected, in the 'Calibrated baseline', all the ratios fall to figures very close to 1. Noticeably, there are six countries that present underestimation (ratios below 1) before the calibration procedure. For these countries, the calibration has no effect, since it just selects all the eligible individuals without reaching the target expenditure. In some cases, ratios are close to one, which might indicate simultaneously accurate simulations (because all the eligibility conditions can be simulated) and low non-take-up. Others are clearly lower than 1 (Cyprus, Czechia and Germany). This might be because in EUROMOD we observe yearly incomes, and therefore, we are not able to capture fluctuation of incomes over the year.[12] Another possible reason for the underestimation of MI schemes is the absence in EU-SILC of homeless individuals and people living in collective households. If, in reality, these groups are covered by MI schemes, EUROMOD will not be able to simulate their

[12] EUROMOD concretely simulates the entitlement to MI according to average monthly incomes (i.e. total annual incomes divided by 12), whereas in practice, incomes may be assessed over shorter periods, such as on a monthly or quarterly basis. This implies that potential short-term entitlements might not be captured in our simulations.

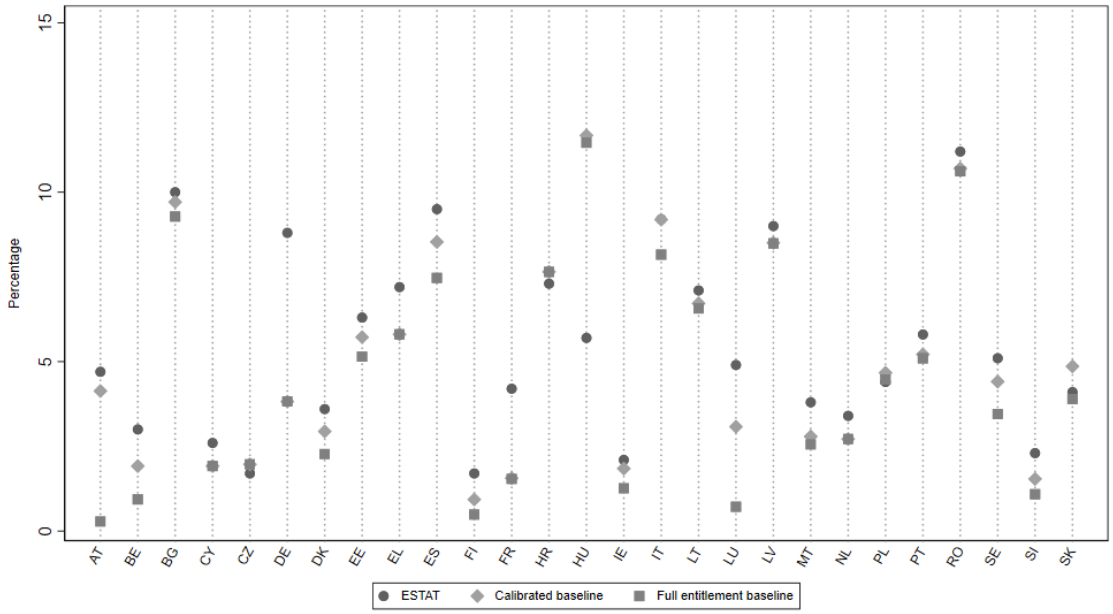
entitlements, leading to underestimation of the effectiveness of MI schemes. This is a limitation of our approach, which affects only a few countries (Cyprus, Czechia and Germany). Moreover, it is worth noting that, even if statistics about expenditure are in principle more unambiguous vis-à-vis the number of beneficiaries, some comparability issues might persist (e.g. expenditure on some residual schemes being accounted for in the administrative figures but not in the simulated results).

Second, we present the impact of our calibration on the AROP rate. The adjustment of MI schemes due to the calibration procedure has an impact mostly on the lower part of the income distribution, and therefore, we consider an AROP rate calculated using an extreme poverty criterion, which fixes the poverty line at 40% of median equivalised disposable income. The results are presented in Figure 1 and Table A.3 of the Appendix, showing the AROP rate in three scenarios: i) the 'Full entitlement baseline', ii) the 'Calibrated baseline' and iii) official Eurostat figures based on EU-SILC (i.e. based on self-reported incomes). As expected, we find that in most countries the AROP rate reported by Eurostat is higher than the one simulated in the 'Full entitlement baseline', which reflects the potential overestimation of MI support produced by the EUROMOD simulations without any calibration, as well as the possible underreporting of MI schemes and other benefits by households with low income in survey data, which can lead to higher AROP rates.[13] Once we apply our calibration procedure, the estimated AROP rates, i.e. those given by the 'Calibrated baseline', are generally closer to the ones reported by Eurostat.[14] This is particularly the case for Austria, Luxembourg and Sweden. Our calibration therefore contributes to a more accurate estimation of the extent of (extreme) poverty in a microsimulation setting, which might prove relevant in light of simulating potential reforms and inform policy-makers.

[13] Hungary is a clear exception to this rule. In this case, the "Full entitlement baseline" significantly overestimates the AROP rate with respect to the one reported by Eurostat.

[14] There are some exceptions, including the countries whose MI schemes are already undersimulated in EUROMOD (Cyprus, Czechia, Germany, Greece and Netherlands) and for which the calibration is not applicable. In these cases, the AROP rates in the 'Full entitlement baseline' and the 'Calibrated baseline' are the same.

Figure 1. At-risk-of-poverty (AROP) rate (40% poverty line) reported by Eurostat, Full entitlement baseline and Calibrated baseline



Notes: Eurostat data are based on EU-SILC 2020 (incomes 2019) for all countries except IT, which is based on EU-SILC 2019 (incomes 2018). AROP rates are calculated using a poverty line set at 40% of the median equivalised disposable income.
Source: Our own elaboration using EUROMOD.

4. Assessing the effectiveness of existing MI schemes in EU countries

Having developed a corrected, new baseline, we can turn to an evaluation of the effectiveness of existing MI schemes as simulated in this baseline. We perform this evaluation considering three main dimensions: first, the coverage and adequacy of the schemes; second, their poverty-alleviation effects; and, third, the consequent total expenditure. Results are presented for each Member State and at the EU level. The EU level averages in this paper are unweighted, meaning that each country weighs the same.

4.1. Coverage and adequacy

Figure 2 presents estimates of the percentage of individuals benefitting, or not, from MI support. A beneficiary is defined as any individual living in a household for which at least one MI scheme has been granted. Results are presented in percentage of the total poor population, prior to MI support, for each country to ease comparability and take into account the fact that this is the main target population of the benefit. The poor population in each country is defined using two common values for the poverty line: 40% (extreme poverty criterion) and 60% (standard poverty criterion) of the median equivalised disposable income. Individuals are classified into three different types according to their poverty status and receipt of MI support: (i) individuals that are poor before MI support

and are beneficiaries (poor beneficiaries); (ii) individuals that are not poor before MI support but still receive it (non-poor beneficiaries); and (iii) individuals that are poor before MI support but are not beneficiaries (poor non-beneficiaries).

The concept of coverage has been subject to considerable discussion (see Nelson & Nieuwenhuis, 2021 for a recent contribution towards consolidating a framework for its analysis). In our setting, we define coverage as the share of poor beneficiaries, regardless of whether they remain in poverty or are lifted out of it after MI receipt, over the total poor population before MI.[15]

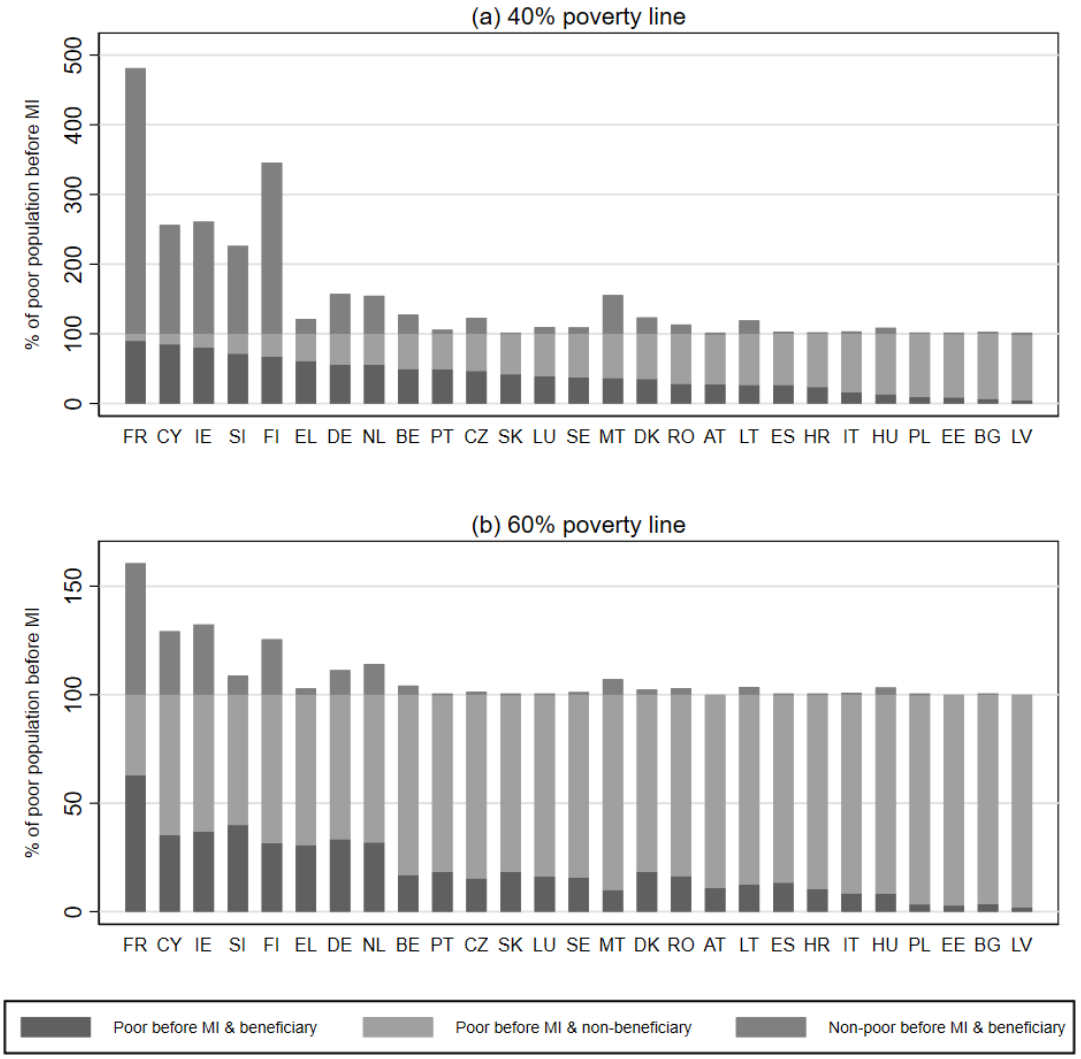
MI schemes depict a heterogeneous coverage across EU Member States. When using an extreme poverty criterion, coverage rates of poor individuals vary from 5% (in Latvia) to 90% (in France). Overall, most countries fail in covering most of the poorest population, with only eight countries depicting coverage rates above 50%. The countries showing the highest coverage are France, Cyprus, Ireland and Slovenia, whereas the lowest coverage is observed in Estonia, Bulgaria[16] and Latvia. In the latter group, up to 90% of the poorest individuals are left without MI support. As expected, considering a broader target population (i.e. counting poor individuals using the 60% poverty line) results in significant decreases of the coverage rates, which vary now from 2% (in Latvia) to 63% (in France).[17]

[15] This should be broadly in line with the concept used by Figari et al. (2013), although in their analysis, they focus on working-age individuals. Conversely, here we compute this indicator for the whole poor population, as some of the schemes include the elderly among the potential beneficiaries (this is the case, for instance, in Bulgaria and Romania).

[16] Note that in Bulgaria the heating allowance is not included in the list of MI schemes under assessment. This programme has similar features as monthly social assistance, but is more generous in terms of total spending and coverage. Hence, our estimates might be considered as a lower bound.

[17] As shown in the Appendix, results on coverage are sensible regarding the choice of the weight.

Figure 2. Coverage of Minimum Income (MI) schemes, classification of individuals according to poverty status and MI support



Notes: The axis is drawn at different scales in the top and bottom graphs. The sum of poor beneficiaries and poor non-beneficiaries equals the total poor population. The accounting for non-poor beneficiaries may result in coverage rates above 100%. In countries where two MI schemes are considered in this assessment, the joint impact of both schemes is reflected in the graph.
Source: Our own elaboration using EUROMOD.

Furthermore, the targeting of MI schemes is imperfect in relation to the (monetary) poverty criteria used, as a non-negligible number of non-poor individuals end up receiving MI support**.** This effect is quite substantial in some EU Member States (e.g. France, Finland and Ireland), especially when measuring poverty under an extreme poverty criterion. This may be due to several reasons, namely guaranteed MI thresholds being above the 40% poverty line, the use of different equivalence scales in MI rules as compared with the OECD modified scale and/or narrower definitions of the MI assessment unit vis-à-vis the household. Noticeably, in some countries, the share of non-poor beneficiaries can be as

large (or even larger) than the share of poor non-beneficiaries (e.g. France and Cyprus), potentially suggesting a misallocation of MI support with respect to a pure (monetary) poverty criterion.

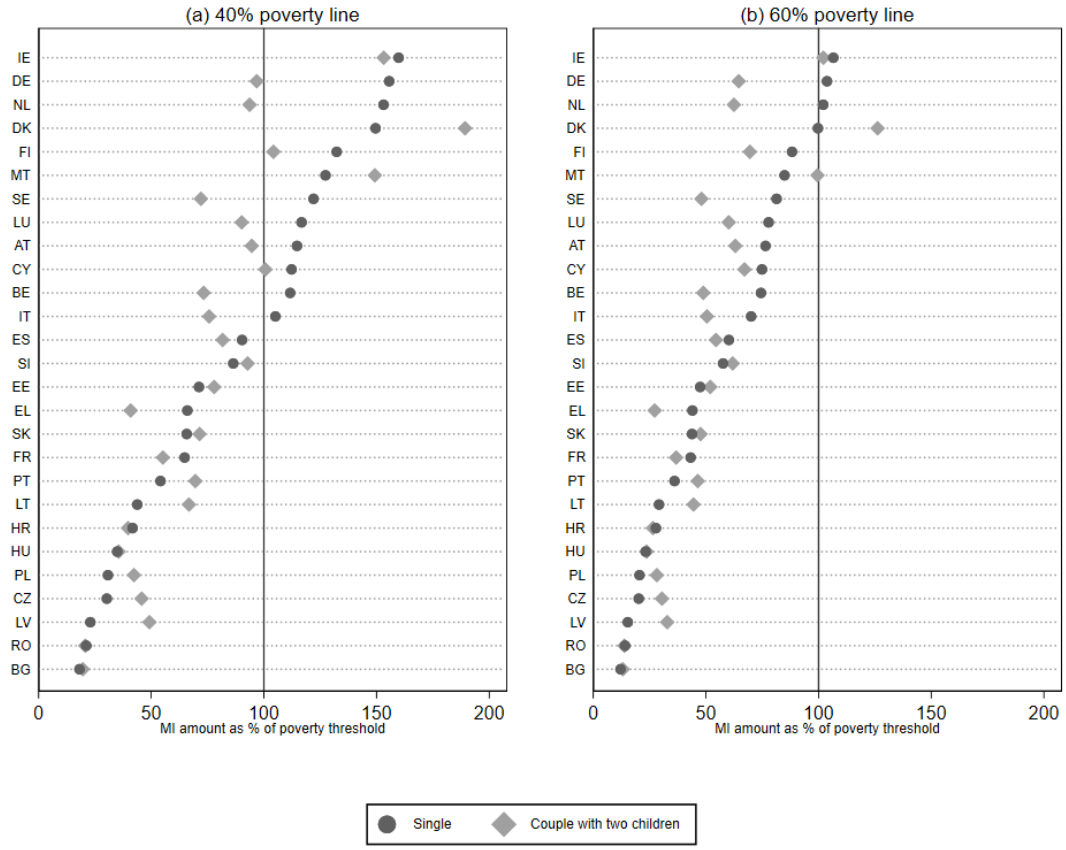
We now move to the assessment of the adequacy, i.e. how generous MI schemes are, analysing two types of hypothetical households: a single adult and a couple with two children. Figure 3 presents the MI amounts as a share of each country-specific poverty lines, considering both the 40% and 60% thresholds. The two hypothetical households have been generated using the Hypothetical Household Tool (HHoT) in EUROMOD (Hufkens et al., 2019). Both units are jobless households, where all adults have been unemployed for the latest 18 months, are actively seeking a job and live in a rented accommodation.[18] This definition aims to approximate the main characteristics of potential candidates of MI support, thus triggering the simulation of the assessed MI schemes in EUROMOD. However, it should be noted that assuming different households' characteristics might lead to different levels of adequacy.

More than half of the EU countries provide MI amounts that are not adequate with respect to an extreme poverty criterion, i.e. the ratio of the MI amount to the 40% poverty line is below one. In particular, the generosity of the schemes in Bulgaria, Romania, Latvia, Czechia, Poland and Hungary is very low (below 40% for a single adult). On the contrary, Ireland, Germany, Netherlands, Denmark, Finland and Malta are the countries providing the highest adequacy (above 120% for a single adult). As expected, when considering a standard poverty criterion (60% poverty line), the adequacy levels decrease for all countries. Under this criterion, only four countries show adequacy levels close to 100% (Ireland, Germany, the Netherlands and Denmark), suggesting that MI schemes in the EU are generally not designed to tackle the extent of standard poverty.

Looking at the differences between the two types of households, we find that in many countries the adequacy of MI support is lower as we consider larger family units. With some exceptions, a couple with two children generally receives a less adequate benefit than a single adult, perhaps suggesting that the equivalence scales of the MI schemes in those countries are not designed to address the costs additional family members bring to the unit.

[18] The housing costs are assumed to be 20% of the country-specific average monthly gross earnings.

Figure 3. Minimum Income (MI) amounts as a share of the poverty line by household types



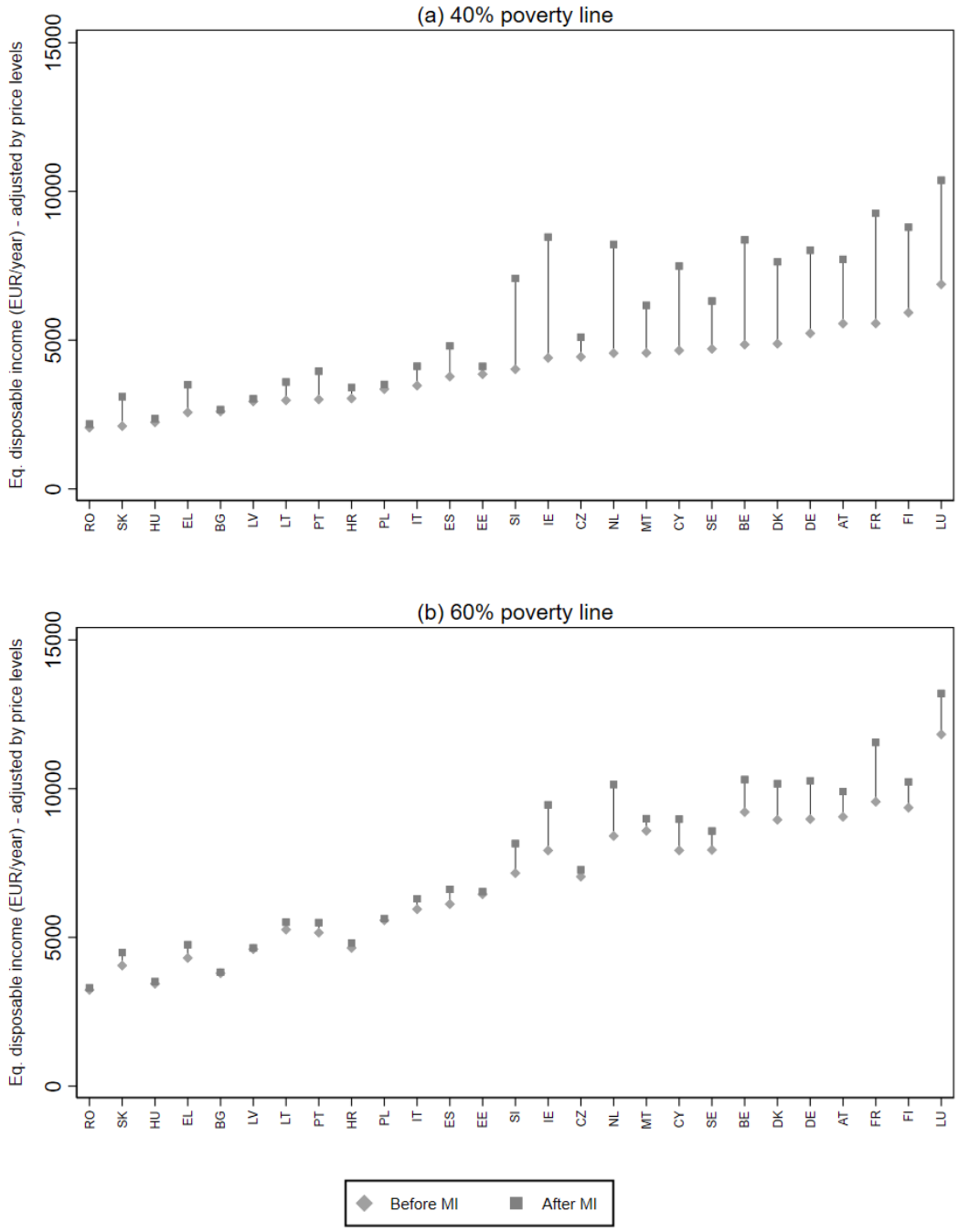
Note: MI amounts are computed at the household level and equivalised using the OECD equivalence scale.
Source: Our own elaboration using EUROMOD.

4.2. Poverty-alleviation effects

To the extent that countries offer a good combination of coverage and adequacy, this should translate into higher disposable incomes of the poorest individuals. Figure 4 depicts the mean annual equivalised disposable income of poor individuals before and after receiving MI support. Results account for the different price levels across EU Member States by dividing the nominal values (EUR) by the Price Level Index of each country as reported by Eurostat to ease the comparability across countries. As before, both the extreme and standard poverty criteria are used to measure the extent of poverty.

Noticeably, the averages are calculated for all poor individuals, independently of whether they receive MI support. This implies that the results should be interpreted considering the extent of adequacy and coverage of the different MI schemes (i.e. average increases in disposable incomes account for the lack of MI support to poor individuals in countries where the coverage rate is low).

Figure 4. Mean equivalised disposable income of poor individuals before and after Minimum Income (MI) support



Notes: In countries where two MI schemes are considered in this assessment, the joint impact of both schemes is reflected in the graph. For this graph, poor individuals are those in poverty in absence of MI support.
Source: Our own elaboration using EUROMOD and Eurostat data on price levels (2019).

Before MI support, the equivalised disposable income of individuals in extreme poverty varies significantly across EU Member States, from 2,000 to 6,800 EUR (in real terms), reflecting the different socioeconomic conditions across EU countries before the last-resort safety nets kick in. The lowest values can be observed in Romania, Slovakia and Hungary, while the highest ones correspond to Germany, Austria, France, Finland and Luxembourg. Despite higher average results, a similar variation can be observed when measuring poverty under the standard poverty criterion.

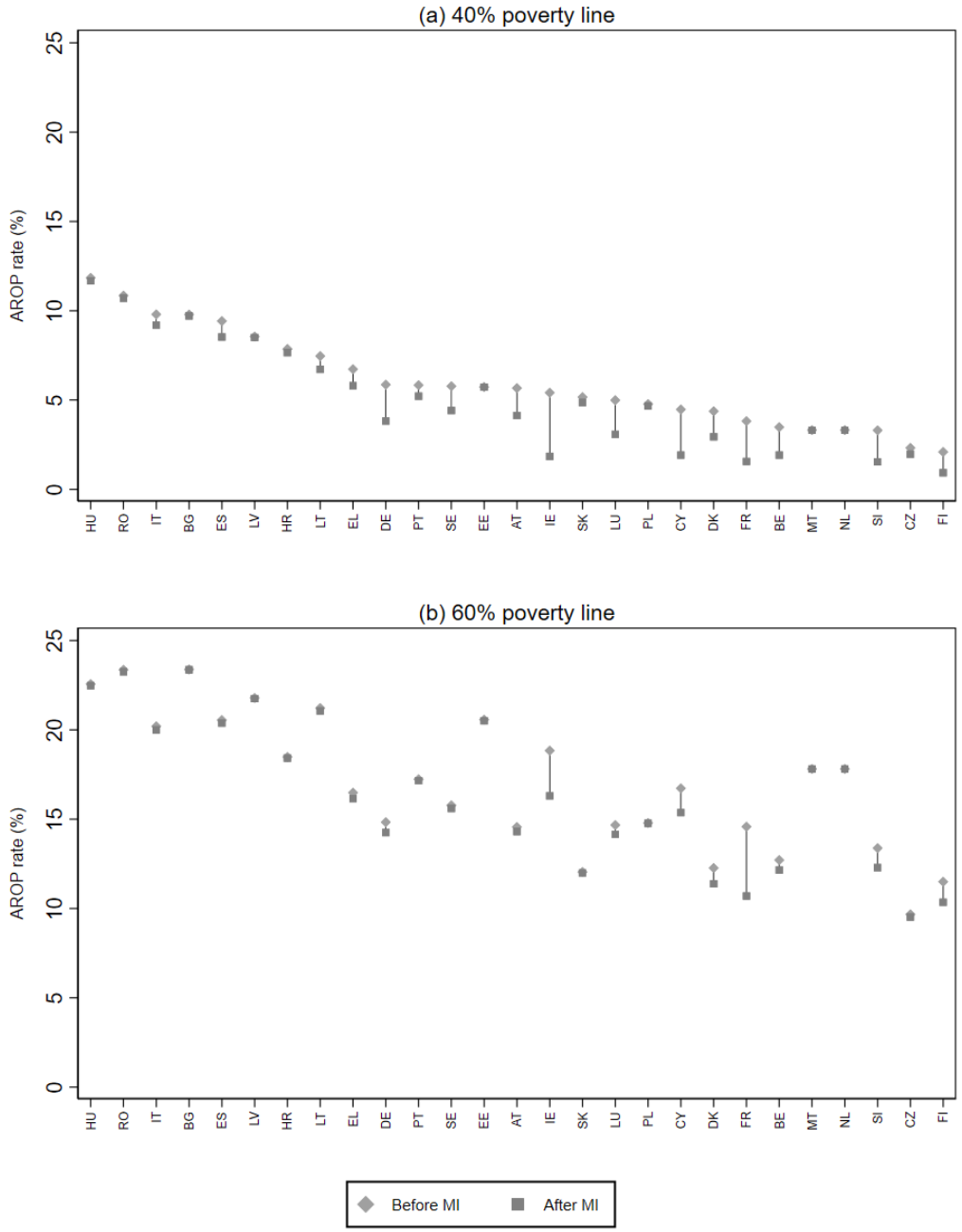
Remarkably, MI schemes do not enable the convergence of disposable incomes of the poorest citizens across the EU, as the best-performing countries before MI support are also those achieving the highest increases in disposable incomes due to MI support. This pattern can be observed very clearly when focusing on individuals in extreme poverty, and it remains visible, although to a lesser extent, for individuals in standard poverty. In particular, the support provided by Ireland, the Netherlands and Cyprus' schemes seems to be significantly efficient at improving the income conditions of the poorest citizens, whereas Latvia, Hungary and Romania's schemes barely entail any increase in average terms. This result is in line with the low coverage rates and adequacy levels found for these countries, both under the 40% and 60% poverty criteria.

A complementary approach to evaluate the effectiveness of MI schemes in improving the income conditions of the poorest individuals is to look at poverty-related indicators. In particular, Figure 5 shows AROP rates before and after MI support for all EU countries. This indicator measures poverty incidence, i.e. the share of population below the poverty line. Once again, we use both the 40% and 60% poverty lines to measure the extent of extreme and standard poverty, respectively.

MI support in most EU countries seems insufficient to lift beneficiaries out of poverty, with a few exceptions. Under an extreme poverty criterion, only a few countries achieve significant reductions in the AROP rate due to MI schemes, in particular Ireland, France, Cyprus and Germany.[19] As expected, the use of a standard poverty criterion worsens the results.

[19] Note that unemployment assistance in Ireland and Germany (Jobseeker's Allowance and *Grundsicherung für Arbeitsuchende*, respectively), and a benefit paid to low-income earners (*Prime d'activité*) in France, are included in the list of MI schemes.

Figure 5. At-risk-of-poverty (AROP) rates before and after Minimum Income (MI) support

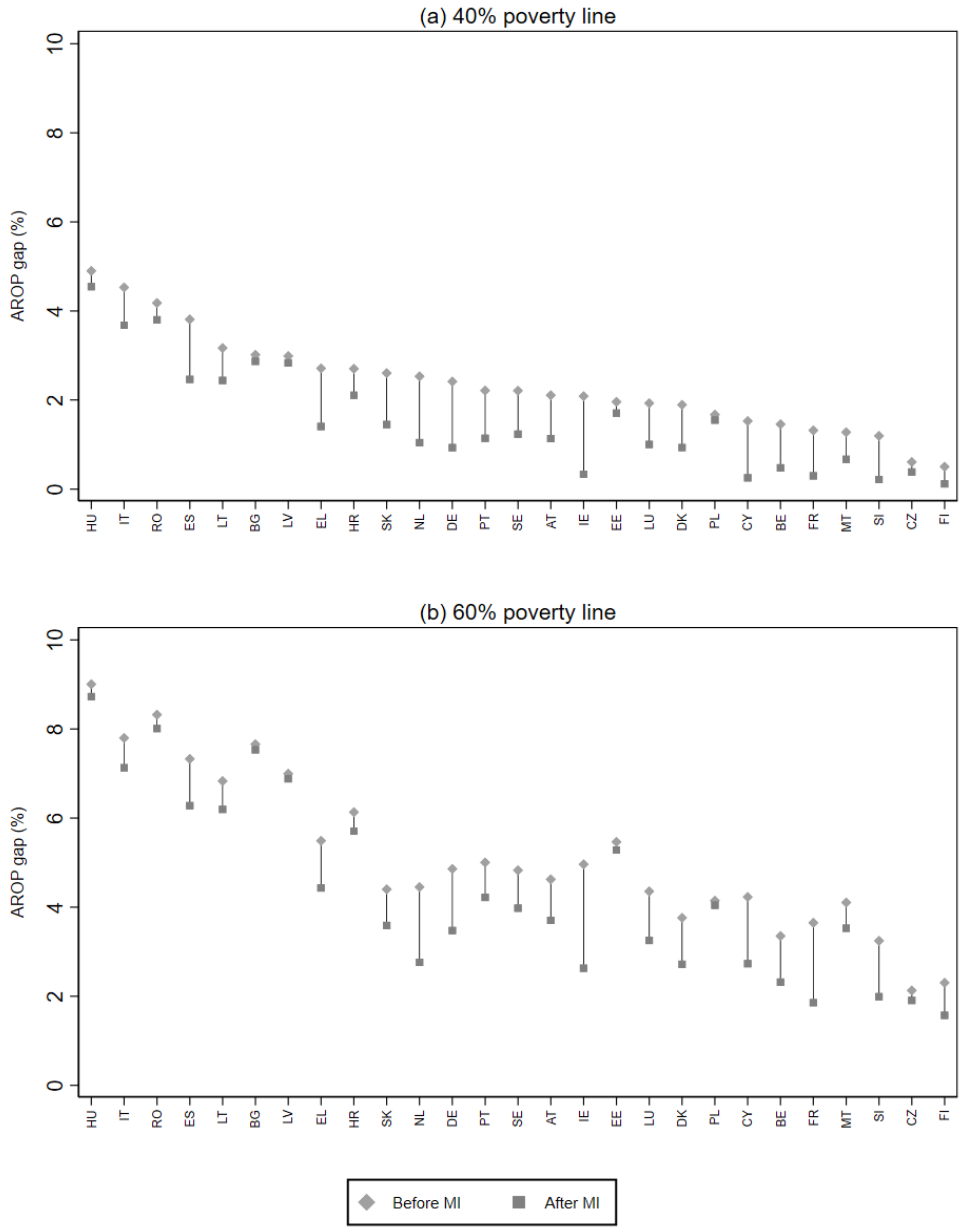


Notes: In countries where two MI schemes are considered in this assessment, the joint impact of both schemes is reflected in the graph. The poverty line is anchored to the counterfactual scenario, where no MI schemes are in place.
Source: Our own elaboration using EUROMOD.

Figure 6 shows a second measure of poverty, AROP gaps, before and after MI support for all EU Member States. This indicator measures the intensity of poverty, i.e. the mean shortfall in income from the poverty line, in percentage of the latter. Both the 40% and 60% poverty lines are used as benchmarks to measure the extent of poverty.

Although existing EU MI schemes may not be sufficient to lift beneficiaries out of poverty, they do reduce the shortfall in income from the poverty line. Once again, there is significant heterogeneity in the performance of the different EU MI schemes, with a few countries significantly reducing AROP gaps (e.g. Ireland, Cyprus, Slovenia and France), whereas others achieve only small reductions (e.g. Romania, Poland, Latvia, Bulgaria and Hungary).

Figure 6. At-risk-of-poverty (AROP) gaps before and after Minimum Income (MI) support

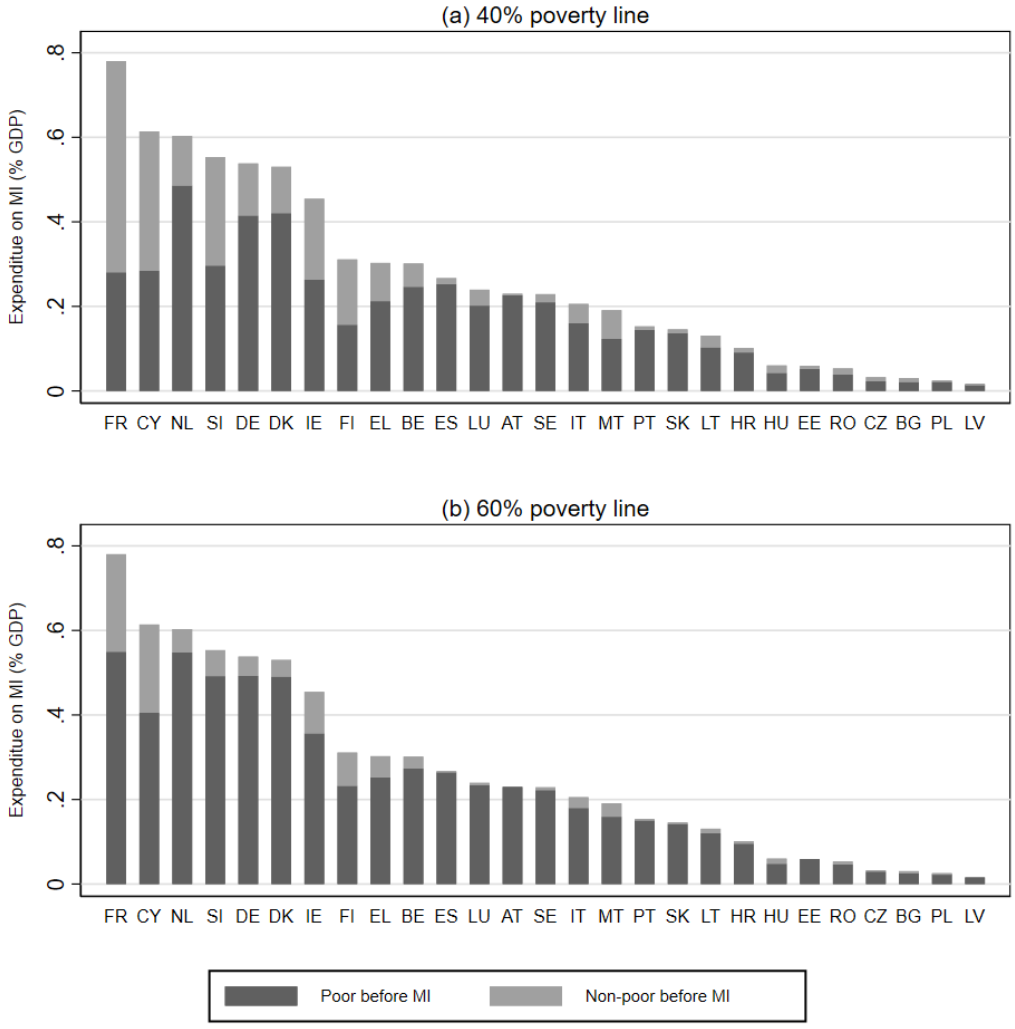


Notes: In countries where two MI schemes are considered in this assessment, the joint impact of both schemes is reflected in the graph. The poverty line is anchored to the counterfactual scenario, where no MI schemes are in place.
Source: Our own elaboration using EUROMOD.

4.3. Expenditure

Figure 7 shows the total expenditure on MI schemes by poor and non-poor beneficiaries across EU countries as a percentage of GDP. The expenditure on MI schemes varies significantly across EU countries, from 0.02% (in Latvia) to 0.78% (in France) of GDP. The six countries depicting the highest expenditure are France, Cyprus, the Netherlands, Slovenia, Germany and Denmark, where MI support represents at least 0.5% of the GDP of each country. On the contrary, in Romania, Czechia, Hungary, Bulgaria, Poland and Latvia, the expenditure in MI schemes accounts for only up to 0.06% of the GDP.

Figure 7. Expenditure on Minimum Income (MI) schemes (% GDP)



Notes: In countries where two MI schemes are considered, the joint impact of both schemes is reflected in the graph.
Source: Our own elaboration using EUROMOD and Eurostat data on GDP (2019).

In most EU countries, the largest share of the MI expenditure goes to the poorest individuals, but there are some countries where a non-negligible share goes to the non-poor. While in countries such as Austria, Spain and Portugal more than 90% of the total

expenditure is targeted to citizens in extreme poverty, in countries such as France, Cyprus and Finland, this share is only between 40% and 50%. As expected, the use of a standard poverty criterion generally implies better allocation towards individuals in poverty, with smaller shares of expenditure being received by non-poor individuals. Importantly, a perfect allocation of the existing resources to the poorest individuals cannot be interpreted as a signal of efficient implementation, as a particular MI scheme may fail to lift individuals out of poverty anyway if its adequacy is deemed insufficient. This only tells us that the overall amount of available resources is being well-distributed, not that this amount is sufficient to cover the needs of the individuals benefitting from support.

5. Exploring possible reforms to existing MI schemes

Having investigated the effectiveness of existing MI schemes in terms of coverage, adequacy and impact on disposable incomes and poverty, we now turn to the simulation of possible reforms. We consider changes to two main elements defining the performance of MI schemes: coverage and adequacy.

The reforms considered are theoretical and not targeted at changing country-specific aspects of the MI scheme of each country. The goal of the simulations is not to provide a comprehensive analysis of all the possible reforms that could be considered by authorities in each country but rather to: (i) provide a methodological framework to think about the main aspects that should be considered when reforming MI schemes; (ii) show how far/close the current MI scheme for each EU country is from eradicating extreme poverty; and (iii) show how this would change if adequacy (first) and coverage (second) improved.

5.1. The reform scenarios: Description and rationale

We simulate a new hypothetical complementary MI scheme, which works as a last-resort safety net for the poorest households, complementing their equivalised disposable incomes up to each country-specific extreme poverty line. The eligibility to the new complementary scheme is only made on a purely monetary basis, with no additional criteria being considered (i.e. there are no age-related criterion, wealth tests or other requirements potentially excluding those in extreme monetary poverty from being eligible to the complement). The unit of assessment is the household, and thus the incomes of all individuals cohabiting are pooled together regardless of their family links. This differs with respect to most MI schemes in EU Member States, where the unit of assessment usually uses a narrower concept (i.e. cohabiting individuals linked by family relations up to a specific degree).[20] The scheme operates after the simulation of all taxes and benefits,

[20] The use of the household as the assessment unit maintains consistency with the standard measurement of incomes in distributional and poverty analyses, which relies on the equivalisation of household disposable incomes as a way of accounting for differences in household size and composition.

including each existing country-specific MI. Hence, the final benefit amount is not taxable, nor included in other means-tested benefits. The amount of the complementary MI support for each household is calculated as the difference between households' equivalised disposable income and each country-specific extreme poverty lines.[21]

Once the new scheme is simulated, we restrict its accessibility to three different populations of interest by considering three possible reform scenarios following a stepwise approach as summarised in Figure 8:

1. 'Increased adequacy to the (40%) poverty line for current beneficiaries' (Increased adequacy, hereinafter): first, the new complementary MI scheme is only assigned to the current beneficiaries of each country's existing MI scheme. Therefore, if the current MI scheme is not adequate to bring the corresponding beneficiary household out of extreme poverty, the new MI scheme financially complements this household's disposable income up to the 40% poverty line. Beneficiaries already receiving an adequate amount are not complemented further. This scenario shows the impact of increasing the generosity of the MI entitlement for the current beneficiaries in poverty by the amount needed to lift them out of extreme poverty.

2. 'Increased coverage by 10 percentage points' (Increased coverage, hereinafter): second, and in addition to the previous scenario, we assign the new complementary MI scheme to a specific number of individuals in extreme poverty who were not receiving the existing country-specific MI scheme such that the coverage rate of MI support increases by 10 percentage points (p.p.). Our measure of coverage is defined as in the previous section: the number of MI beneficiaries that were in poverty before receiving MI support, divided by the total population in poverty before any MI support is granted. This scenario shows the effects of reaching a higher proportion of those in need by increasing the number of beneficiaries of MI support.[22]

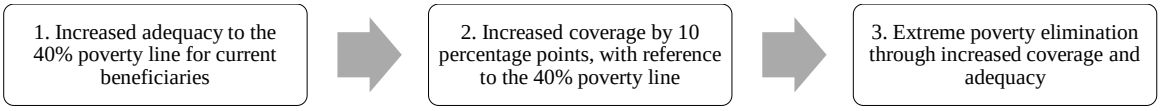
3. 'Poverty elimination through increased coverage and adequacy' (Poverty elimination, hereinafter): third, the new complementary MI scheme is provided to all poor households that had not been selected as beneficiaries in the previous two scenarios. This final scenario measures the impact of eliminating extreme poverty

[21] As shown in Section 4, MI schemes in the EU do not seem designed to tackle the issue of standard poverty (i.e. counting poor individuals using the 60% poverty line) and are pretty far from achieving this purpose. Therefore, the hypothetical scenarios presented in this section show a less costly and ambitious objective, which is eradicating extreme poverty (i.e. counting poor individuals using the 40% poverty line).

[22] Here we are not defining in which way this increase in the number of beneficiaries could be achieved. Two options could be to either enhance the take-up of the schemes or relax some eligibility criteria (e.g. related to age or assets ownership).

in each country and provides a benchmark to which the current MI scheme and the previously simulated scenarios can be compared to.

Figure 8. Stepwise simulations towards eradicating extreme poverty



The results from these simulations are then compared with the ones for the 'Calibrated baseline', as presented in Section 3, to understand the impacts of the reforms on the effectiveness of MI schemes, considering the same set of indicators as in Section 4. Importantly, our results should be interpreted as 'morning-after effects', as we abstract from potential behavioural responses triggered by the simulated reforms. These responses might distort the outcomes of a specific policy change, moving away from the original objectives. Regarding MI schemes, behavioural responses usually refer to labour supply disincentives (see, for instance, Bargain & Doorley, 2011), justifying the introduction of accompanying labour activation strategies (e.g. participation in training programmes, guidance and application to job vacancies). Furthermore, our results do not capture potential consumption and saving behavioural reactions that might occur as a response to changes in households' disposable incomes (see, among others, Nelson, 2012, on the relationship between minimum income levels and material deprivation).

5.2. Impacts on coverage and adequacy

The impacts of the three reform scenarios on coverage and adequacy are determined by construction. It is, however, useful to briefly describe these impacts to render the mechanics of the reform scenarios clear.[23]

For all countries, moving from the 'Calibrated baseline' to the 'Increased adequacy' scenario entails no impact in coverage, as it only implies a change in the amounts received by each current beneficiary, without generating any new recipient. Therefore, the coverage rates remain the same as those obtained in Figure 2. The amounts provided become perfectly adequate, as they allow all beneficiaries to be lifted out of extreme poverty.

Also for all countries, moving from the 'Increased adequacy' scenario to the 'Increased coverage' scenario implies an increase in the coverage rate of 10 p.p. Noticeably, this translates into very different absolute increases in the number of beneficiaries, depending on the initial coverage rate. For countries with very low initial coverage rates (e.g. Poland, Estonia, Bulgaria and Latvia), the number of beneficiaries more than doubles, while for

[23] Figure A.4 in the Appendix provides a visual representation of the coverage rate in the baseline and the three reform scenarios to clarify the intuition of the simulated reform scenarios.

countries with high initial coverage rates (e.g. France, Cyprus, Ireland and Slovenia), the change is relatively small. Adequacy levels remain the same as in the previous scenario, as all the beneficiaries, 'old' and 'new', are assumed to receive the necessary amount to reach the 40% poverty line.

Finally, moving from the 'Increased coverage' scenario to the 'Poverty elimination' scenario effectively implies increasing the coverage rate up to 100% for almost all countries. This is expected given that, in this scenario, all individuals who are in extreme poverty receive MI support such that their equivalised disposable income equals the 40% poverty line. As in the previous scenarios, there is full adequacy. For a few country-specific cases, namely Greece, Poland and Slovakia, the coverage rate does not exactly reach 100%. This can be explained by the larger extent of negative disposable incomes in these three countries.[24] In presence of individuals with negative disposable incomes, the new complementary MI scheme treats them as if they had zero incomes so that the top-up benefit does not go above the guaranteed MI level.

5.3. Impacts on poverty alleviation

We now focus on households whose income falls below the extreme poverty line, despite the existing MI schemes. Figure 9 shows the percentage change in the mean annual equivalised disposable income of individuals in extreme poverty implied by each reform scenario relative to the baseline.

The average equivalised disposable income of individuals in extreme poverty at the EU27 average level would increase by 4.9% in the 'Increased adequacy' scenario, by 11.6% in the 'Increased coverage' scenario and up to 27.6% in the 'Poverty elimination' scenario, although a high variation is observed across EU Member States. Overall, this reflects both the change in the level of the benefit for current beneficiaries and the access to the new adequate entitlement for previously excluded individuals.

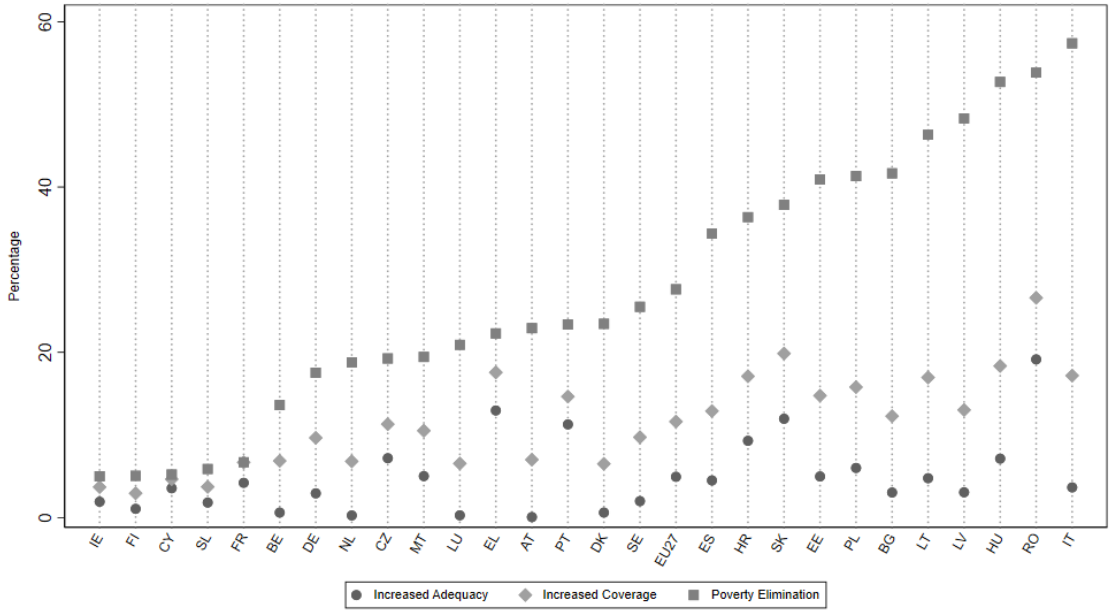
Looking at the differences across EU Member States, we see that in Greece, Portugal and Romania, an increase in adequacy (i.e. providing more generous amounts to the current beneficiaries) would imply a non-negligible increase in household disposable income. In contrast, in Austria, Luxembourg, the Netherlands, Denmark and Belgium, an increase in adequacy would not lead to a significant rise in disposable income, suggesting that the main levers for change in the effectiveness of the MI schemes in these countries are related to coverage.

Overall, an increase in both adequacy and coverage would lead to a significant increase in household disposable income (about 50% or more) of individuals in extreme poverty,

[24] In these countries, negative disposable incomes usually arise in presence of self-employed individuals that might have to pay fixed social insurance contributions regardless of their level of self-employment incomes.

mostly through adequacy in Romania and through coverage in Italy, Hungary and Latvia. In the countries where the main issue seems to be related to coverage, there might be room for enhancing the targeting of these schemes via the promotion of the take-up and/or the adjustment of the eligibility criteria towards the inclusion of those in monetary extreme poverty. On the contrary, in Ireland, Finland, Cyprus, Slovenia and France, the increase in household disposable income would be less than 10%, suggesting that, in these countries, the potential of reforms towards coverage and adequacy of MI schemes to increase poor households' disposable income is somewhat more limited.

Figure 9. Change in mean disposable income of poor individuals implied by each reform scenario (relative to the baseline scenario, 40% poverty line)



Note: The EU27 value corresponds to the arithmetical average of the 27 Member States.

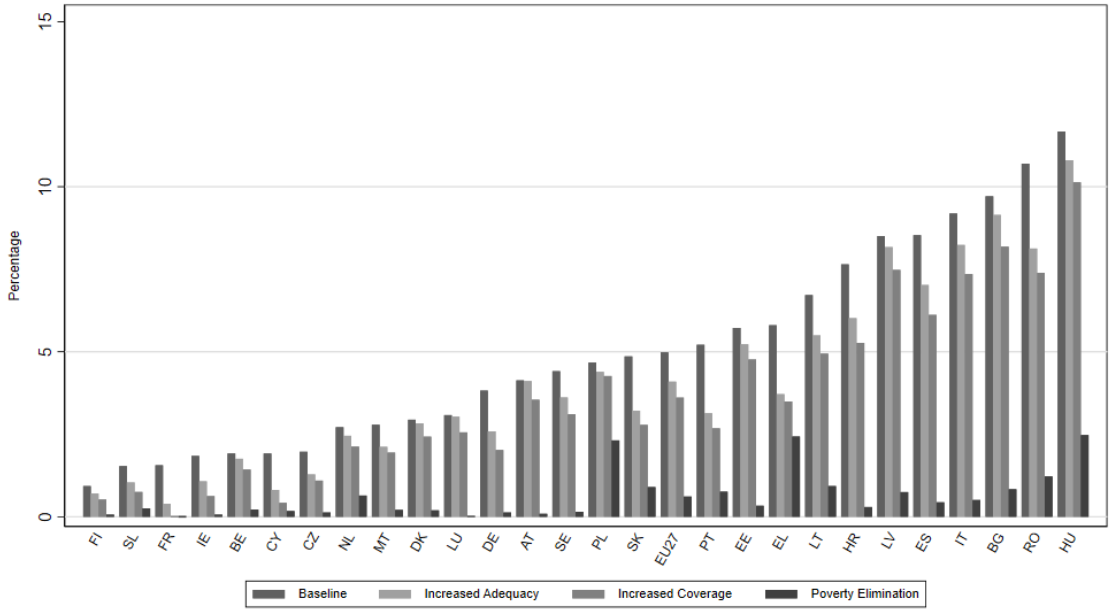
Source: Our own elaboration using EUROMOD.

Complementarily, we look at the impact of the three reform scenarios on the AROP rates, presented in Figure 10. We find that the 'Increased adequacy' scenario would lead to a non-negligible decrease in extreme poverty in Romania, Greece and Portugal. This confirms our previous findings, indicating that an increase in adequacy in these countries would be effective at increasing households' disposable income and, hence, reducing the risk of extreme poverty. At the EU27 average level, the AROP rate would decrease from 5% to 4.1%.

Implementing the 'Increased coverage' scenario (i.e. enlarging each current country-specific coverage rate by 10 p.p.) would lead to an additional reduction in the extreme AROP rate in all EU Member States, in particular in Bulgaria, Italy and Spain, although in most countries the reduction would not be very substantial and would be smaller than the reduction obtained in the first scenario.

Lastly, and as expected, the 'Poverty elimination' scenario would bring the extreme AROP rates close to zero in all countries.[25] For the majority of countries, a substantial decrease in the AROP rate would be achieved in this third scenario, suggesting that efforts towards reaching potentially excluded households from MI support would be the key element of potential reforms.

Figure 10. At-risk-of-poverty (AROP) rates in the baseline and reform scenarios (40% poverty line)



Note: The EU27 value corresponds to the arithmetical average of the 27 Member States.

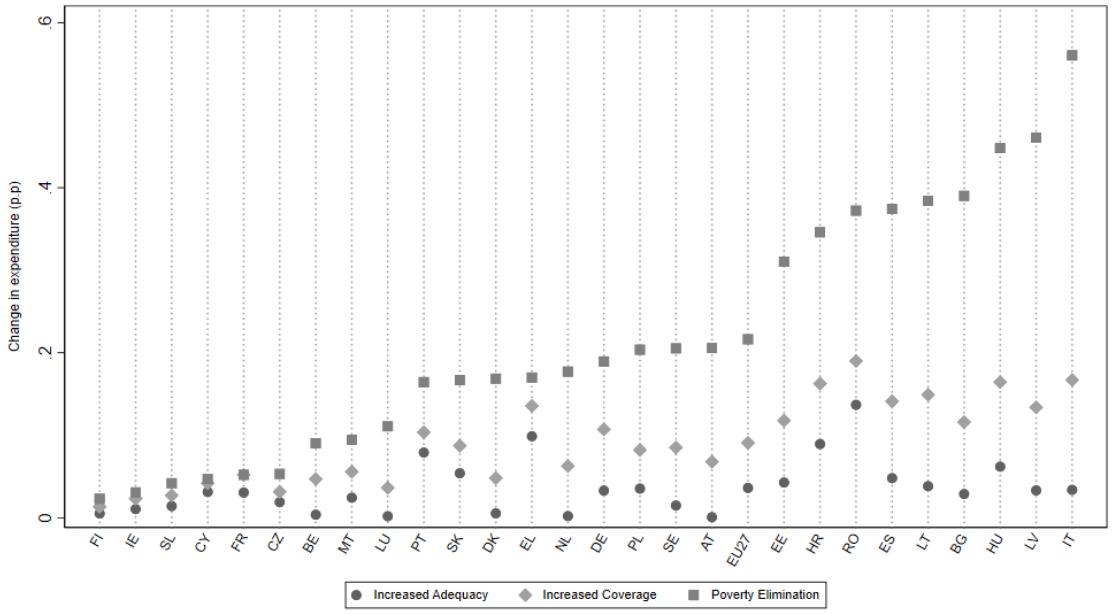
Source: Our own elaboration using EUROMOD.

5.4. Impacts on expenditure

In this final subsection, we look at what would be the cost of these hypothetical reforms. Figure 11 shows the change in expenditure, with MI schemes (as a percentage of GDP) implied by each reform scenario based on the extreme poverty line in p.p. with respect to the values obtained in the 'Calibrated baseline'.

[25] As previously mentioned, note that income losses (for example, from self-employment) are not compensated by the MI schemes, so a few households with net negative incomes still remain below the poverty line. This explains why the AROP rates are not exactly zero, in particular in EL, PL and SK.

Figure 11. Change in expenditure implied by each reform scenario (as a % of GDP, relative to the baseline scenario, 40% poverty line)



Note: The EU27 value corresponds to the arithmetical average of the 27 Member States.

Source: Our own elaboration using EUROMOD.

At the EU27 average level, moving to the 'Increased adequacy' scenario entails an increase in the expenditure to GDP ratio of 0.036 p.p., reflecting the higher amounts of MI support implied by moving all MI beneficiaries to each country-specific extreme poverty line. An increase in the expenditures is observed in all countries, but the values of these increases are highly heterogeneous. They are particularly high in Romania, Greece, Croatia and Portugal, suggesting that the provision of more generous amounts to the current beneficiary households in those countries could have significant budgetary consequences.

Moving to the 'Increased coverage' scenario, we observe at the EU27 average level an increase in the expenditure to GDP ratio of approximately 0.09 p.p. compared with the baseline scenario. The increase in coverage rates is, therefore, slightly more costly than the increase in adequacy levels. At the country level, the increases in expenditure are once again highly heterogeneous, varying from 0.01 p.p. in Finland, where the initial coverage rate is among the highest in the EU, up to 0.19 p.p. in Romania, whose initial coverage is poorly targeted.[26]

Finally, considering the 'Poverty elimination' scenario, the increase in the expenditure to GDP ratio at the EU27 average level would be 0.22 p.p. relative to the baseline, meaning

[26] The cost of this scenario would depend on how far from the 40% poverty line are the new beneficiaries that make up the additional 10 p.p. increase in the coverage rate.

that the additional cost of providing MI support to lift all poor households in the EU out of poverty relative to the status quo would be rather low, and far from unattainable. For some countries, such as Finland, Ireland, Slovenia, Cyprus and France, the additional expenditure would be rather small, suggesting that poverty elimination would require a relatively marginal effort. For others, such as Italy, Latvia, Hungary, followed by Bulgaria, Lithuania, Spain, Romania and Croatia, the increase in expenditure would vary between 0.3 p.p. and 0.6 p.p., indicating that complete poverty elimination could be a somewhat ambitious objective given the existing coverage rates and adequacy levels.

6. Conclusions

MI schemes are an important tool available to policy-makers to alleviate poverty and fight social exclusion by guaranteeing a last-resort safety net to households with insufficient resources. An accurate assessment of the effectiveness of these schemes in terms of their design and reach is crucial to identify potential gaps and avenues for reforms. Despite its relevance, this assessment faces several data and modelling limitations, which often lead to an under or overestimation of the number of beneficiaries of MI support, and to a bias in the measurement of the real impact of this support on disposable incomes and poverty.

In this paper, we attempt to provide an integrated and consistent evaluation of the effectiveness of MI schemes in the EU in three main steps. First, we develop a simple method to calibrate the simulation of MI schemes in the microsimulation model EUROMOD to tackle the limitations of existing approaches and obtain a new 'closer to reality' baseline simulation of each EU Member State's scheme. Second, we use this corrected baseline to evaluate existing MI schemes, investigating their degree of coverage and adequacy, their impacts on disposable income and poverty, and their overall cost. Third, we explore the effects of possible (theoretical) reforms, implementing sequential changes to the levels of coverage and adequacy towards full poverty elimination.

Our results suggest that the coverage rate of existing MI schemes is quite heterogeneous across EU countries but generally insufficient, with most countries reaching less than 50% of households in extreme poverty and some having coverage rates as low as 5%. Intuitively, this might explain why during the COVID-19 crisis several countries felt the need to implement temporary schemes for social assistance, somewhat calling into doubt the potential automatic stabilisation properties of the existing MI schemes. Moreover, we find that the benefit levels provided by the existing schemes are not adequate enough to provide a minimum standard of living in more than half of the EU countries, with the generosity of the support being below 50% of the extreme poverty line for several countries. Furthermore, in many countries, the adequacy of MI support is lower for larger families vis-à-vis single-person households, perhaps suggesting that the equivalence scales of the MI schemes in these countries are not designed to address the costs additional family members bring to the unit. The combination of the different coverage and adequacy levels

across EU countries results in heterogeneous effects on disposable incomes and poverty alleviation. Remarkably, MI schemes do not enable the convergence of disposable incomes of the poorest citizens across the EU, as the best-performing countries before MI support are also those with the highest increases in disposable incomes after MI support. In addition, MI support in most EU countries seems insufficient to lift beneficiaries out of poverty. Nevertheless, it does play an important role in almost all countries in reducing the shortfall in incomes from the poverty line.

There is scope for overcoming some of the gaps in current MI schemes through reforms affecting both the coverage and adequacy of these schemes. Although with high heterogeneity across EU countries, our results suggest that increasing the generosity of the benefits for the current MI beneficiaries up to the extreme poverty threshold would require an increase in the expenditure to GDP ratio of only 0.036 p.p. for the EU as a whole. Expanding the coverage rate by 10 p.p. would, in turn, imply an additional increase in expenditure of 0.054 p.p. Extending coverage to all poor households, such that extreme poverty is fully eliminated, would imply an overall additional cost of 0.22 p.p. relative to the expenditure to GDP ratio produced by existing MI schemes. Therefore, the additional cost of providing MI support to lift all poor households in the EU out of poverty (relative to the status quo) would be rather low, and far from unattainable.

The analysis performed in this paper provides a framework to think about the main aspects to consider when evaluating and reforming MI schemes, and gives fresh insights into the effectiveness of current MI schemes in the EU and possible ways to reform them. The main takeaways are that the contribution of MI support to poverty elimination is still rather limited in some EU countries and that action could be taken to increase coverage and adequacy, moving towards poverty elimination, at a relatively low financial cost.

Despite its potential usefulness, the analysis is, naturally, not without limitations. First, our results are pure 'morning-after effects', abstracting from any possible behavioural reactions to the simulated reforms. Indeed, our approach only sets up a static benchmark to assess the current performance of MI schemes and how this would change under policy reforms aimed at increasing their adequacy and coverage. A more comprehensive assessment should incorporate a dynamic approach, with a concrete focus on behavioural reactions, both from a supply (e.g. labour supply effects) and demand perspective (e.g. changes in consumption and savings). Second, the reforms considered are theoretical and do not account for any country-specific aspects of the design of MI schemes, simply exploring the effects of changing coverage and adequacy in a uniform way for all countries. In reality, implementing these changes can be achieved through different means: enabling better accessibility to the MI schemes (i.e. promoting take-up by improving access to information, decreasing bureaucratic procedures, fighting stigmatisation), softening the

eligibility criteria (i.e. perhaps reconsidering the role of asset tests[27] and other non-income conditions, such as minimum age), moving towards a closer consideration of adequacy vis-à-vis poverty thresholds, etc. A more complete and informative analysis should provide a discussion and evaluation of the different reform possibilities available for each country based on the characteristics of the country's scheme. Third, the results are sensitive to the approach adopted for the calibration of the new baseline, in particular the choice of the weight defining the importance of the random and deterministic components affects the resulting coverage rates. A more accurate analysis should try to estimate this parameter for each country or perform more refined calibrations in light of the availability of more disaggregated data. Fourth, some issues might still persist in terms of comparability, given that some schemes with similar features as social assistance (e.g. housing benefits) were not included in the list of MI schemes under assessment. In countries where these schemes play a significant role in alleviating poverty, our results for coverage and adequacy levels can be considered as a lower bound and reforms aimed at improving these levels would be less expensive. Finally, our analysis focuses on a pre-COVID year, whereas several reforms were implemented in the EU to cushion the effects of the COVID-19 crisis. Some of these measures relate to MI schemes and might become permanent in the aftermath of the crisis. When more up-to-date data will be available, this analysis could be updated taking into account the most recent policy changes in this context.

The above discussed limitations provide important avenues for future research. In particular, considering the behavioural effects on work incentives and consumption patterns of MI reforms would be an important step towards a more comprehensive analysis of the effectiveness of MI schemes. In the same vein, the simulation of MI schemes could be extended to consider not only cash transfers but also in-kind benefits, such as free childcare or food stamps, which in some countries may play an important role in ensuring a minimum living standard.

[27] See Marchal et al. (2021) for a comprehensive analysis of the impact of asset tests within MI schemes.

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Appendix 1

Table A.1. Validation of Minimum Income (MI) schemes, before and after calibration

Country	EUROMOD policy	MI scheme	Simulation results - Calibrated baseline		Simulation results - Full entitlement baseline		O
			X (1)	N (2)	X (3)	N (4)	X
AT	bsa_at	Guaranteed minimum resources (Mindestsicherung)	913.6	69.9	2,583.5	430.7	9
BE	bsa_be	Integration income (revenu d'intégration/leefloon)	1,441.4	157.4	3,163.8	504.1	1,4
BG	bsa00_bg	Monthly social assistance allowances (Месечни социални помощи)	36.9	32.1	113.0	92.4	3
CY	bsamm_cy	Guaranteed Minimum Income (Ελάχιστο Εγγυημένο Εισόδημα)	141.3	31.5	141.3	31.5	19
CZ	bsa_cz	Allowance for Living (Příspěvek na živobytí)	1,875.1	68.4	1,875.1	68.4	2,7
DE	bsa00_de	Subsistence benefit (Hilfe zum Lebensunterhalt)	748.3	191.2	748.3	191.2	1,5
	bunnc_de	Unemployment assistance for jobseekers (Grundsicherung für Arbeitsuchende)	17,946.7	2,781.9	17,946.7	2,781.9	27,
DK	bsa_dk	Social assistance (kontanthjælp)	12,288.2	97.1	23,717.4	221.8	12,
EE	bsa00_ee	Subsistence benefit (toimetulekutoetus)	16.4	6.1	55.5	28.3	1
EL	bsa00_el	Guaranteed Minimum Income (ΕΛΑΧΙΣΤΟ ΕΓΓΥΗΜΕΝΟ ΕΙΣΟΔΗΜΑ)	554.6	248.0	554.6	248.0	60
ES	bsarg_es	Regional Minimum Income Schemes (Rentas Mínimas de Inserción)	1,929.5	379.7	1,933.2	717.1	1,9
	bsa00_es	Minimum Living Income (Ingreso Mínimo Vital)	1,390.8	208.5	4,589.2	1,125.9	1,4
FI	bsa00_fi	Social assistance (toimeentulotuki)	746.3	174.0	1,110.6	298.7	75
FR	bsa00_fr	Active solidarity income (revenu de solidarité active, RSA)	10,103.8	2,914.1	11,873.0	3,743.2	10,
	bsawk_fr	Employment bonus (Prime d'activité)	8,920.1	3,908.1	9,442.4	4,298.8	9,0
HR	bsa_hr	Guaranteed minimum benefit (Zajamčena minimalna naknada)	416.9	42.5	421.6	45.0	42
HU	bsa_hu	Benefit for persons in active age (aktív korúak ellátása)	28,494.4	92.2	44,095.4	159.7	28,
IE	bsa00_ie	Supplementary Welfare Allowance	120.3	7.4	959.5	126.4	12
	bunnc_ie	Jobseeker's Allowance	1,501.1	230.8	1,501.1	230.8	1,6
IT	bsamm_it	Guaranteed Minimum Income (Reddito di Cittadinanza)	3,694.9	552.2	7,221.2	1,591.3	3,6
LT	bsa00_lt	Social benefit (socialinė pašalpa)	64.0	34.7	88.2	56.8	6
LU	bsacm_lu	Social inclusion income (revenu d'inclusion sociale, Revis)	150.1	8.6	326.9	27.6	15
LV	bsamm_lv	Guaranteed minimum income benefit (Pabalsts garantētā minimālā ienākuma līmeņa nodrošināšanai)	4.9	7.7	13.0	29.0	4
MT	bsa_mt	Social assistance (Ghajnuna Socjali)	22.8	5.6	38.5	12.6	2
	bunmt_mt	Unemployment Assistance (Għajnuna għal-Diżimpjieg)	4.0	1.0	4.3	1.8	3
NL	bsagross_nl bsanet_nl	Participation Act (Participatiewet)	4,904.2	553.4	4,904.2	553.4	5,6
PL	ben_sa_pl	Periodic Allowance (Zasiłek okresowy)	558.7	105.6	1,291.6	377.5	55
PT	bsa00_pt	Social minimum income (Rendimento social de inserção)	327.1	117.5	348.9	144.9	32
RO	bsa_ro	Social Aid (ajutor social)	564.5	325.1	775.2	469.9	55
SE	bsamt_se	Social assistance - livelihood support (Ekonomiskt bistånd)	11,528.1	171.6	17,055.0	357.4	11,
SI	bsa_si	Financial Social Assistance (denarna socialna pomoč)	267.8	60.0	343.5	99.3	26
SK	bsa_sk	Material Need Assistance (Pomoc v hmotnej núdzi)	137.1	44.0	316.5	172.2	13

Notes: Simulation results correspond to year 2019. For LV and ES, the permanent changes introduced to their MI schemes in 2020 have been included in th national currency. Number of beneficiaries in EUROMOD correspond to heads of the different MI assessment units and are expressed in thousands. Officia Reports, and they correspond to 2019 (latest available data in most countries) unless otherwise stated in the column 'comments' of Table A.2.

Table A.2. Country-specific comments on the simulation and calibration of Minimum Income (MI) schemes in

Country	EUROMOD policy	MI scheme	Comments
AT	bsa_at	Guaranteed minimum resources (Mindestsicherung)	MI benefit rules are partly different in all federal states. Only the system o
BE	bsa_be	Integration income (revenu d'intégration/leefloon)	Original non-take-up adjustment in place in the public version of EUROM calibration
BG	bsa00_bg	Monthly social assistance allowances (Месечни социални помощи)	
CY	bsamm_cy	Guaranteed MI (Ελάχιστο Εγγυημένο Εισόδημα)	Number of official beneficiaries not available in EUROMOD Country Rep Database, 2016
CZ	bsa_cz	Allowance for Living (Příspěvek na živobytí)	
DE	bsa00_de	Subsistence benefit (Hilfe zum Lebensunterhalt)	
	bunnc_de	Unemployment assistance for jobseekers (Grundsicherung für Arbeitsuchende)	
DK	bsa_dk	Social assistance (kontanthjælp)	
EE	bsa00_ee	Subsistence benefit (toimetulekutoetus)	Original non-take-up adjustment in place in the public version of EUROM
EL	bsa00_el	Guaranteed MI (ΕΛΑΧΙΣΤΟ ΕΓΓΥΗΜΕΝΟ ΕΙΣΟΔΗΜΑ)	
ES	bsarg_es	Regional MI Schemes (Rentas Mínimas de Inserción)	Special calibration being applied to preserve the heterogeneous coverage o 2020 (to be consistent with the enter in force of the national scheme)
	bsa00_es	Minimum Living Income (Ingreso Mínimo Vital)	Official data obtained from national sources, corresponding to May 2021: beneficiaries/expenditure over the year
FI	bsa00_fi	Social assistance (toimeentulotuki)	Original non-take-up adjustment in place in the public version of EUROM
FR	bsa00_fr	Active solidarity income (revenu de solidarité active, RSA)	Original non-take-up adjustment in place in the public version of EUROM
	bsawk_fr	Employment bonus (Prime d'activité)	
HR	bsa_hr	Guaranteed minimum benefit (Zajamčena minimalna naknada)	Original non-take-up adjustment in place in the public version of EUROM
HU	bsa_hu	Benefit for persons in active age (aktív korúak ellátása)	
IE	bsa00_ie	Supplementary Welfare Allowance	Original non-take-up adjustment in place in the public version of EUROM
	bunnc_ie	Jobseeker's Allowance	
IT	bsamm_it	Guaranteed MI (Reddito di Cittadinanza)	Preliminary official data obtained from national sources, corresponding to hence the levels of adequacy are calculated based on a duration of nine mo
LT	bsa00_lt	Social benefit (socialinė pašalpa)	
LU	bsacm_lu	Social inclusion income (revenu d'inclusion sociale, Revis)	
LV	bsamm_lv	Guaranteed MI benefit (Pabalsts garantētā minimālā ienākuma līmeņa nodrošināšanai)	MI is strictly connected to the housing benefit. We assume that if the cali also set to 0 (same take-up behaviour for both benefits) Municipality differences cannot be accounted for in the model, as there is of Riga municipality are simulated (as this is the biggest municipality)
MT	bsa_mt	Social assistance (Ghajnuna Socjali)	
	bunmt_mt	Unemployment Assistance (Għajnuna għal-Diżimpjieg)	
NL	bsagross_nl bsanet_nl	Participation Act (Participatiewet)	
PL	ben_sa_pl	Periodic Allowance (Zasiłek okresowy)	Original non-take-up adjustment in place in the public version of EUROM
PT	bsa00_pt	Social MI (Rendimento social de inserção)	
RO	bsa_ro	Social Aid (ajutor social)	Original non-take-up adjustment in place in the public version of EUROM
SE	bsamt_se	Social assistance - livelihood support (Ekonomiskt bistånd)	
SI	bsa_si	Financial Social Assistance (denarna socialna pomoč)	Original non-take-up adjustment in place in the public version of EUROM
SK	bsa_sk	Material Need Assistance (Pomoc v hmotnej núdzi)	EUROMOD simulations include also additional supplementary allowanc Disentangling all these allowances from the main one was not feasible and Original non-take-up adjustment in place in the public version of EUROM

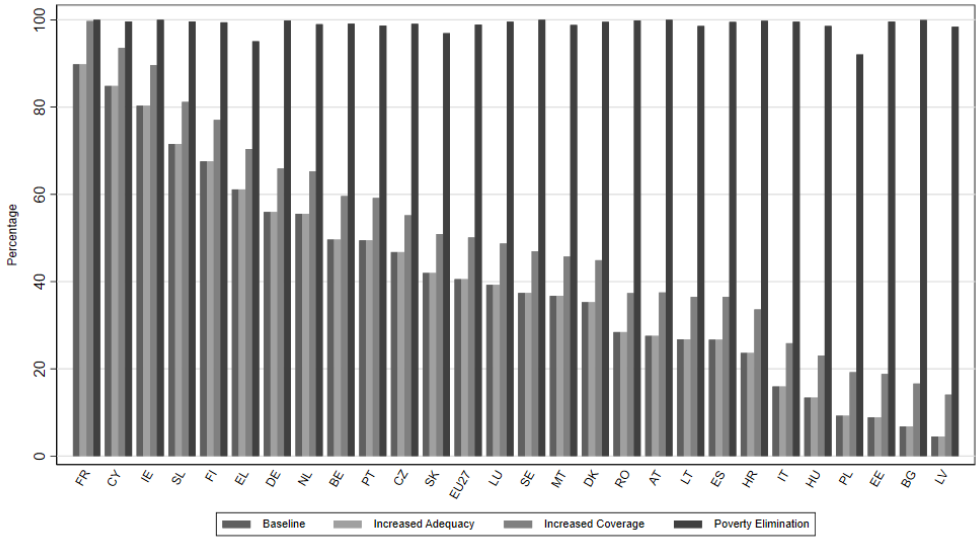
Notes: Simulation results correspond to year 2019. For Latvia and Spain, the permanent changes introduced to their MI schemes in 2020 have also been inc

Table A.3. Validation of at-risk-of-poverty (AROP) rate (40% poverty line), before and after the calibration

Country	AROP rate			Validation ratio w.r.t. ESTAT	
	ESTAT	Calibrated baseline	Full entitlement baseline	Calibrated baseline	Full entitlement baseline
AT	4.7	4.1	0.3	0.88	0.06
BE	3.0	1.9	0.9	0.64	0.31
BG	10.0	9.7	9.3	0.97	0.93
CY	2.6	1.9	1.9	0.74	0.74
CZ	1.7	2.0	2.0	1.16	1.16
DE	8.8	3.8	3.8	0.43	0.43
DK	3.6	2.9	2.3	0.82	0.63
EE	6.3	5.7	5.1	0.91	0.82
EL	7.2	5.8	5.8	0.81	0.81
ES	9.5	8.5	7.5	0.90	0.79
FI	1.7	0.9	0.5	0.55	0.29
FR	4.2	1.6	1.5	0.37	0.37
HR	7.3	7.7	7.6	1.05	1.05
HU	5.7	11.7	11.5	2.05	2.01
IE	2.1	1.8	1.3	0.88	0.60
IT	9.2	9.2	8.2	1.00	0.89
LT	7.1	6.7	6.6	0.95	0.93
LU	4.9	3.1	0.7	0.63	0.15
LV	9.0	8.5	8.5	0.94	0.94
MT	3.8	2.8	2.6	0.73	0.67
NL	3.4	2.7	2.7	0.80	0.80
PL	4.4	4.7	4.5	1.06	1.02
PT	5.8	5.2	5.1	0.90	0.88
RO	11.2	10.7	10.6	0.96	0.95
SE	5.1	4.4	3.5	0.86	0.68
SI	2.3	1.5	1.1	0.67	0.47
SK	4.1	4.9	3.9	1.19	0.95

Notes: Eurostat data are based on EU-SILC 2020 (income 2019) for all countries except Italy, which is based on EU-SILC 2019. AROP is calculated using a poverty line at 40% of the median equivalised disposable income.
Source: Our own elaboration using EUROMOD.

Figure A.4. Coverage rate of Minimum Income (MI) schemes in the baseline and in the three reform scenarios



Source: Our own elaboration using EUROMOD.

Table A.4. Beneficiaries MI schemes – number of observations in EUROMOD before (Full entitlement baseline) and after (Calibrated baseline) the calibration

Country	Number of observations	
	Full entitlement baseline	Calibrated baseline
AT	581	96
BE	669	205
BG	185	72
CY	414	414
CZ	95	95
DE	720	720
DK	317	79
EE	241	50
EL	984	984
ES	1322	552
FI	1156	627
FR	2086	1851
HR	273	257
HU	241	154
IE	688	473
IT	873	325
LT	172	97
LU	329	93
LV	189	47
MT	206	92
NL	668	668
PL	612	181
PT	562	446
RO	408	289
SE	299	137
SI	867	503
SK	420	106

Source: Our own elaboration using EUROMOD

Appendix 2

The sensitivity of the calibration to the parameter *w*

In this section, we present the sensitivity of our results to different specifications of the probability to be selected as beneficiary. As discussed in Section 2, we define the probability of receiving the benefit based on a deterministic and a random component:

$$P_i = w * RC_i + (1 - w) * DC_i$$

For the main results, we assigned the same weight to the deterministic and the random component, meaning that we assume $w = 0.5$. In this Appendix, we assess to what extent the choice of the parameter w influences our results using two alternative weights: a full deterministic assignment ($w = 0$) and a full random approach ($w = 1$).

Table A.5. shows how results on expenditure, number of beneficiaries, AROP rates and gaps are sensitive to our choice of w. For these indicators, we present the ratio between the two alternative weights ($w = 0$ and $w = 1$) with respect to the default choice of $w = 0.5$. A ratio close to 1 means that our result is not affected by the choice of the weight, while a ratio larger (smaller) than 1 means that with the new weight we obtain a higher (lower) estimate.

Table A.5. Sensitivity of main indicators to the choice of parameter *w* of the calibration procedure

	Expenditure			Number of beneficiaries*			AROP** rates after MI*** support			AROP gaps after MI support		
Country	Mil. EUR	Ratio w.r.t [w = 0.5]		Thousands	Ratio w.r.t [w = 0.5]		Percentage	Ratio w.r.t [w = 0.5]		Percentage	Ratio w.r.t [w = 0.5]	
	[w = 0.5]	[w = 0]	[w = 1]	[w = 0.5]	[w = 0]	[w = 1]	[w = 0.5]	[w = 0]	[w = 1]	[w = 0.5]	[w = 0]	[w = 1]
AT	913.8	1.00	1.00	137.5	0.82	2.19	4.13	1.07	0.90	1.14	1.00	1.16
BE	1,441.7	1.01	1.00	302.2	0.82	2.08	1.92	0.89	1.28	0.48	0.60	1.99
BG	18.9	1.01	0.99	66.7	0.78	1.24	9.71	1.00	0.99	2.87	1.02	0.99
CY	141.6	1.00	1.00	93.8	1.00	1.00	1.92	1.00	1.00	0.25	1.00	1.00
CZ	73.7	1.00	1.00	168.5	1.00	1.00	1.97	1.00	1.00	0.38	1.00	1.00
DE	18,695.4	1.00	1.00	5,364.0	1.00	1.00	3.82	1.00	1.00	0.93	1.00	1.00
DK	1,646.8	1.00	1.03	147.7	0.75	1.66	2.94	0.91	1.07	0.93	0.85	1.16
EE	16.5	1.01	0.97	7.6	0.86	1.89	5.72	1.00	1.00	1.71	0.99	1.01
EL	554.8	1.00	1.00	584.2	1.00	1.00	5.81	1.00	1.00	1.41	1.00	1.00
ES	3,320.6	0.99	1.07	1,294.7	0.97	1.32	8.53	0.99	1.00	2.46	1.01	0.96
FI	746.4	1.00	1.00	356.5	0.58	1.31	0.93	0.55	1.19	0.12	0.46	1.56
FR	19,024.1	1.00	1.00	11,147.3	0.90	1.05	1.56	0.99	1.12	0.30	0.98	1.30
HR	56.4	1.00	1.00	81.1	0.92	1.04	7.65	1.00	1.00	2.11	1.01	1.00
HU	88.2	1.00	1.01	246.3	0.93	1.21	11.67	0.98	0.99	4.55	0.99	1.02
IE	1,621.6	1.00	1.00	648.6	1.00	1.04	1.84	1.02	1.21	0.33	0.90	1.73
IT	3,695.0	0.98	0.99	1,142.1	0.83	1.66	9.19	1.02	0.98	3.68	1.00	1.01
LT	64.1	0.98	0.99	96.2	0.73	1.19	6.72	0.99	1.01	2.44	0.99	1.03
LU	150.3	1.01	1.00	14.4	0.86	1.84	3.08	1.05	1.03	1.00	0.86	1.26
LV	4.9	1.01	0.98	7.7	0.83	1.56	8.50	1.00	1.00	2.83	1.00	0.99
MT	27.0	1.00	1.00	14.8	1.00	1.13	2.79	1.00	1.01	0.67	1.00	0.99
NL	4,904.7	1.00	1.00	1,023.3	1.00	1.00	2.72	1.00	1.00	1.04	1.00	1.00
PL	131.3	0.98	0.99	195.0	0.85	2.52	4.67	1.01	1.00	1.55	1.00	1.01
PT	327.3	1.00	1.00	331.3	0.87	1.14	5.21	1.00	0.98	1.14	1.00	1.02
RO	119.3	0.99	0.99	884.2	0.82	1.07	10.70	0.99	0.99	3.80	0.99	1.01
SE	1,091.5	1.00	1.00	271.5	0.71	1.64	4.41	1.04	0.94	1.23	0.93	1.05
SI	268.1	1.00	1.00	131.6	0.76	1.36	1.54	0.82	0.97	0.22	0.70	1.40
SK	137.2	0.99	0.99	120.4	0.84	1.78	4.86	1.04	0.94	1.45	1.00	1.22

Notes: *MI beneficiaries are individuals living in households for which at least one MI has been granted. **AROP: at-risk-of-poverty; ***MI: Minimum Income

Source: Our own elaboration using EUROMOD. Expenditures are expressed in levels (in mil. EUR), number of beneficiaries (in thousands) and AROP rates and gaps (in percentage).

By construction, our calibration optimises the expenditure levels such that these remain unchanged no matter the choice of the parameter w, thus matching the expenditure levels reported in the aggregated official data. Consequently, the expenditure ratios with respect to the default choice of $w = 0.5$ are approximately one for all countries.

The optimisation of the expenditure levels vis-à-vis the aggregated official data is achieved through the selection of a specific number of beneficiaries. Concretely, a full deterministic approach ($w = 0$) implies selecting a lower number of beneficiaries (see ratios below 1 with respect to the default calibration), whereas moving towards a full randomised approach ($w = 1$) increases the number of beneficiaries (see ratios above 1 with respect to the default calibration).

Performing the calibration assuming a full deterministic assignment tends to produce lower AROP gaps after MI support for some countries. For instance, in Belgium and Finland, the AROP gaps are approximately halved with respect to the default calibration ($w = 0.5$). In other countries, the deviation is nevertheless not that large, even when the number of beneficiaries varies significantly across different weights (see, for instance, Belgium or Romania). On the contrary, applying a full randomised approach generally results in higher AROP gaps.

The variation in AROP rates is mostly stable, and we do not observe big discrepancies with respect to the default calibration. Broadly speaking, changes in AROP rates across different weights are highly dependent on how transitions around the poverty threshold take place. In countries where the adequacy of the MI schemes is not sufficient for individuals to transit out of poverty, using different weights does not entail significant changes in AROP rates, as the equivalised disposable income of MI beneficiaries would remain below the poverty threshold anyway.

Overall, we conclude that the coverage rate (number of beneficiaries) is sensitive to the choice of the weight, AROP gaps variate only in some countries, whereas AROP rates are generally stable.